

CLAIMS

1. An apparatus for combining two or more streams that when mixed produce a vapor stream containing one or more components that can condense to form liquids and/or solids at temperatures above ambient, said apparatus comprising:

a vessel having an outer wall defining an interior space;

a baffle wall located in said interior space and in proximity to said outer wall to create an annular space between an outer side of said baffle wall and an inner said of said outer wall for receiving at least one dilution stream, said baffle wall having an inner side that defines a combining space and a baffle wall opening for delivering said dilution stream from said annular space to said combining space;

at least one dilution stream inlet extending through said outer wall for delivering said dilution stream which is a vapor having a dew-point temperature that is less than that of a combined vapor stream and with a temperature above the dew-point temperature of said combined vapor stream to said annular space;

at least one injection fluid stream inlet extending through said outer wall and through an opening in said baffle wall for delivering an injection stream to said combining space;

at least one combined vapor stream outlet extending through said outer wall for delivering said combined vapor stream from said vessel.

2. An apparatus as defined in Claim 1 wherein said vessel is cylindrical in shape.

3. An apparatus as defined in Claim 1 wherein said injection stream inlet is located at an opposite end of said vessel relative to said mixed vapor stream outlet.

4. An apparatus as defined in Claim 3 wherein said injection stream inlet further is located along a vessel centerline.

5. An apparatus as defined in Claim 1 wherein said injection stream inlet includes a nozzle.
6. An apparatus as defined in Claim 1 wherein said baffle wall opening for delivering said dilution stream from said annular space to said combining space is located in proximity to said injection stream inlet.
7. An apparatus as defined in Claim 1 wherein said baffle wall is connected to said vessel wall in proximity to said mixed vapor stream outlet.
8. An apparatus as defined in Claim 1 wherein the exterior of said vessel is provided with insulation.
9. An apparatus as defined in Claim 5 wherein an interior injection stream inlet pipe leading to said nozzle is insulated.
10. An apparatus as defined in Claim 3 wherein said outlet end of the vessel is tapered to a narrower diameter.
11. A process for combining two or more streams that when combined produce a vapor stream containing one or more components that can condense to form liquids and/or solids at temperatures above ambient, said process comprising:
  - (a) delivering at least one dilution stream comprising a vapor having a dew-point temperature that is less than the temperature of a final combined vapor stream and with a temperature above the dew point of said combined vapor stream into an annular space in said vessel formed by an inner side of a vessel wall and an outer side of a baffle wall and allowing said dilution stream to flow through said annular space to a baffle wall opening and into an interior combining space in said vessel formed by an inner side of said baffle wall;
  - (b) delivering at least one injection stream to said interior combining space;

- (c) combining said dilution stream with said injection stream in said interior combining space to form said combined vapor stream; and
- (d) withdrawing said combined vapor stream from said interior combining space through a vessel outlet.

12. A process as defined in Claim 11 wherein said dilution stream is delivered to one end of said vessel and flows through said annular space to said baffle wall opening and countercurrent to said combined vapor stream.

13. A process as defined in Claim 12 wherein said baffle wall opening is located in proximity to the point of delivery of said injected stream.

14. A process as defined in Claim 11 wherein said dilution stream is superheated steam and the injected stream is a liquid.

15. A process as defined in Claim 14 wherein said injected stream is a liquid, aqueous solution comprises an ionic alkali metal.

16. A process as defined in Claim 15 wherein said ionic alkali metal comprises potassium.

17. A process as defined in Claim 11 wherein said dilution stream contains a component that is reactive with a component contained in said injected stream.

18. A process as defined in Claim 11 wherein said injected stream comprises a pure-component liquid, liquid solution, solid-liquid slurry, vapor, or gas with suspended solids

19. An apparatus for combining two or more streams that when mixed produce a liquid stream containing one or more components that will condense to form solids at temperatures above ambient, said apparatus comprising:

a vessel having an outer wall defining an interior space;

a baffle wall located in said interior space and in proximity to said outer wall to create an annular space between an outer side of said baffle wall and an inner side of said outer wall for receiving at least one dilution stream, said baffle wall having an inner side that defines a combining space and a baffle wall opening for delivering said dilution stream from said annular space to said combining space;

at least one dilution stream inlet extending through said outer wall for delivering said dilution stream which is a liquid having an initial solidification point temperature that is less than that of a combined stream and has a temperature above the initial solidification point temperature of said combined stream to said annular space;

at least one injection fluid stream inlet extending through said outer wall and through an opening in said baffle wall for delivering an injection stream to said combining space;

at least one combined stream outlet extending through said outer wall for delivering said combined stream from said vessel.

20. A process for combining two or more streams that when combined produce a liquid stream containing one or more components that will condense to form solids at temperatures above ambient, said process comprising:

- (a) delivering at least one dilution stream comprising a liquid having an initial solidification point temperature that is less than the temperature of a final combined liquid stream and with a temperature above the initial solidification point temperature of said combined liquid stream into an annular space in said vessel formed by an inner side of a vessel wall and an outer side of a baffle wall and allowing said dilution stream to flow

- through said annular space to a baffle wall opening and into an interior combining space in said vessel formed by an inner side of said baffle wall;
- (b) delivering at least one injection stream to said interior combining space;
  - (c) combining said dilution stream with said injection stream in said interior combining space to form said combined liquid stream; and
  - (d) withdrawing said combined liquid stream from said interior combining space through a vessel outlet.